

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A gassed emulsion explosive composition comprising an emulsion, excluding micro-emulsions, in combination with a gasser composition,

5 the emulsion having a discontinuous aqueous phase comprising inorganic oxygen releasing salts, a continuous water immiscible organic phase and a poly[alk(en)yl] succinic anhydride based emulsifier, and

the gasser composition having a solution of an inorganic nitrite, an ammonium species and optionally an accelerator,

10 wherein the reaction between the inorganic nitrite and ammonium species occurs within droplets of the gasser solution such that there is substantially no chemical attack on the emulsifier.

2. A gassed emulsion explosive according to claim 1 wherein the emulsifier is a  
15 polyisobutylene succinic anhydride based emulsifiers.

3. A gassed emulsion explosive according to any of the preceding claims wherein the gasser solution pH is between pH 5 and pH 9.

20 4. A gassed emulsion explosive according to claim 3 wherein the gasser solution pH is between pH 6 and pH 8.

5. A gassed emulsion explosive according to any of the preceding claims wherein the ratio of inorganic nitrite to ammonium species is between 10:1 and 1:10.

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6. A gassed emulsion explosive according to any of the preceding claims wherein the molar proportion of ammonium species is up to 10% greater than the molar proportion of inorganic nitrite.

30 7. A gassed emulsion explosive according to any of the preceding claims wherein the

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ammonium species and inorganic nitrite are present in equimolar quantities.

8. A gassed emulsion explosive according to either claim 1 or claim 2 wherein the ammonium species and inorganic nitrite are present in equimolar quantities and the gasser solution pH is between pH 5 and pH 9.

9. A gassed emulsion explosive according to any of the preceding claims wherein the ammonium species is chosen from the group comprising ammonium chloride, ammonium nitrate, ammonium chlorate, ammonium perchlorate and combinations thereof.

10. A gassed emulsion explosive according to any of the preceding claims wherein the ammonium species is formed in situ in the gasser composition.

11. A gassed emulsion explosive according to any of the preceding claims wherein the ammonium species comprises up to 25 wt% of the gasser solution.

12. A gassed emulsion explosive according to any of the preceding claims wherein the inorganic nitrite is chosen from the group comprising alkaline earth nitrites, alkali metal nitrite or combinations thereof.

13. A gassed emulsion explosive according to any of the preceding claims wherein the inorganic nitrite comprises up to 25 wt% of the gasser solution.

14. A gassed emulsion explosive according to any of the preceding claims wherein the gasser solution comprises an accelerator chosen from the group comprising thiourea, urea, thiocyanate, iodide, cyanate, acetate and combinations thereof.

15. A gassed emulsion explosive according to any of the previous claims wherein the accelerator comprises up to 25 wt% of the gasser solution.

16. A gassed emulsion explosive according to any of the preceding claims having a density of less than 1.0 g/cc.

17. A gassed emulsion explosive according to claim 16 wherein the gassed emulsion explosive has a density of less than 0.8g/cc.

18. A method of forming the gassed emulsion explosive of claim 1 the method comprising the steps of:

(a) forming a gasser solution comprising a solution of an inorganic nitrite, an ammonium species and optionally an accelerator,

(b) adding the gasser solution to an emulsion such that droplets of gasser composition are distributed throughout the emulsion, and

(c) allowing the gasser solution to react and form gas which is distributed as bubbles throughout the emulsion to form the gassed emulsion explosive composition.

19. A method of gassing according to claim 18 wherein the inorganic nitrite and ammonium species are mixed to form the gasser solution immediately before addition of the gasser solution to the emulsion.

20. A method of gassing according to claim 18 wherein the inorganic nitrite and ammonium species are mixed to form the gasser solution during addition to the emulsion.

21. A method of gassing according to any of claims 18 to 20 wherein the gasser solution pH is between pH 5 and pH 9.

22. A method of gassing according to claim 21 wherein the gasser solution pH is between pH 6 and pH 8.

23. A method of gassing according to any of claims 18 to 22 wherein the ratio of inorganic nitrite to ammonium species is between 10:1 and 1:10.

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24. A method of gassing according to any of claims 18 to 23 wherein the ammonium species and inorganic nitrite are present in equimolar proportions.

25. A method of gassing according to any of claims 18 to 24 wherein the ammonium species and inorganic nitrite are present in equimolar quantities and the gasser solution pH is between pH 5 and pH 9.

26. A method of gassing according to claim 23 wherein the molar proportion of ammonium species is greater than the molar proportion of inorganic nitrite.

27. A method of gassing according to any of claims 18 to 26 wherein the ammonium species is chosen from the group comprising ammonium chloride, ammonium nitrate, ammonium chlorate, ammonium perchlorate and combinations thereof.

28. A method of gassing according to any of claims 18 to 27 wherein the ammonium species is formed in situ in the gasser composition.

29. A method of gassing according to any of claims 18 to 28 wherein the ammonium species comprises up to 25 wt% of the gasser solution.

30. A method of gassing according to any of claims 18 to 29 wherein the inorganic nitrite is chosen from the group comprising alkaline earth nitrites, alkali metal nitrite or combinations thereof.

31. A method of gassing according to any of claims 18 to 30 wherein the inorganic nitrite comprises up to 25 wt% of the gasser solution.

32. A method of gassing according to any of claims 18 to 31 wherein the gasser solution comprises an accelerator chosen from the group comprising thiourea, urea, thiocyanate, iodide, cyanate, acetate and combinations thereof.

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33. A method of gassing according to any of claims 18 to 32 wherein the gasser solution comprises up to 25 wt% of the gasser solution.

34. A gassed emulsion explosive formed using the gassing method of any of claims 18 to 33.

35. A gassed emulsion explosive which has been partially sensitised using the gassing method of any of claims 18 to 33 and partially sensitised using one or more other sensitisation methods.

36. A gassed emulsion explosive which has been gassed using the gassing method of any one of claims 18 to 33 and which additionally comprises closed cell void material chosen from the group comprising glass microballons, plastic microballons and mixtures thereof.

37. A gassed emulsion explosive according to any one of claims 34 to 36 having a density of less than 1.0 g/cc.

38. A gasser solution substantially as herein described with reference to the Examples.

39. A method of gassing substantially as herein described with reference to the Examples.

40. A gassed emulsion explosive substantially as herein described with reference to the Examples.

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